PROFILE OF

ARGONNE NATIONAL LABORATORY - WEST (ANL-W)

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Office of Oversight
Environment, Safety and Health
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FOREWORD

Site profiles provide senior Office of Environment, Safety and Health managers with relevant and current site environment, safety, and health performance information as well as communicating to Department of Energy line management the Office of Oversight's concerns and understanding of site conditions. Site profiles are a key management tool used by the Office of Oversight to focus and prioritize independent oversight evaluation activities and to optimize the allocation of Oversight resources. The Office of Oversight maintains site profiles on 20 major Department of Energy sites, and normally updates each profile semiannually through a process of soliciting Department of Energy line management review and comment on the revised site profile information. Upon resolution of any line management comments, the profile is considered validated and is disseminated.

Site profiles are developed using an institutionalized process of collecting data from multiple sources, and then collating, synthesizing, and analyzing this information to develop a balanced evaluation of environment, safety, and health performance at the site. The data that forms the basis of a site profile comes from sources both internal and external to the Department of Energy. Office of Oversight appraisal activities provide an important source of data. Data is also collected and synthesized from such sources as the Defense Nuclear Facilities Safety Board, the General Accounting Office, state regulators, and Department of Energy line management organizations. This information is reported in a format designed to highlight essential missions, performance, significant issues, and operational data at a management level. The process involves additional field verification of initial conclusions to confirm the validity and significance of the information. All Oversight offices participate in the collection, analysis, interpretation, and validation of site profile information.

As the site profile process matures, the Office of Oversight plans to incorporate additional information into the documents, including a presentation of quantitative measures and trends in environment, safety, and health performance, and a description of safeguards and security activities, performance, and issues.

PROFILE OF

ARGONNE NATIONAL LABORATORY WEST (ANL-W)

OVERVIEW

SITE CHARACTERISTICS

Site characteristics include information on site size and location, mission, organizations, contractual status, and major initiatives and activities.

Additional information on site characteristics is provided in Section 1.0, starting on page 1.

Date Established: 1949

Present Mission:

ANL-W continues its primary mission of developing environmental remediation technologies

Primary - Development of environmental remediation technologies. Activities include decontaminating and defueling of Experimental Breeder Reactor-II (EBR-II), developing techniques for treating EBR-II fuel for long-term storage, preparing sodium waste for disposal, and characterizing solid waste for eventual shipment to the Waste Isolation Pilot Plant (WIPP).

Size: 810 acres of which 84 acres are inside the property protection area.

Employees: Six DOE and 753 contractor personnel (as of May 1996).

Annual Budget: The ANL-W budget is $80 million for fiscal year 1996.

Cognizant Secretarial Officer: Director, Office of Nuclear Energy (NE); the principal NE office is the Facilities Division within the Office of Civilian Reactor Development (NE-44).

Responsible Operations/Area Office: DOE Chicago Operations Office (CH)/Argonne Group-West (ARG-W).

Integrating Contractor: University of Chicago.

Subcontractors: The currently active subcontractors are Ugak (general contractor), and Hughes Roofing.

Fissile Material: About 90 kg of Pu-239, 10 kg of U-235, 7 metric tons of heavy metal, a large amount of spent fuel (about 73,800 fuel assemblies, elements, rods, and plates), and fresh reactor fuel for EBR-II.

Significant Commitments to Stakeholders:

- A Consent Order from the State of Idaho resulted in an agreement with Lockheed Martin Idaho Technologies (LMIT) for ANL-W to process sodium-potassium reactor coolant that was stored in an Idaho National Engineering Laboratory (INEL) bunker. The project is complete.

- An agreement with the State of Idaho for the processing of sodium wastes from FERMI I reactor coolant operations mandated in the Site Treatment Plan, which is required by the Federal Facilities Compliance Act.

- ANL-W is in the process of performing a Remedial Investigation/Feasibility Study in accordance with a Federal Facility Agreement with Environmental Protection Agency Region 10 and the State of Idaho.

ANL-W is performing a Remedial Investigation/Feasibility Study according to a Federal Facility Agreement with the Environmental Protection Agency.

Unions: Oil, Chemical, and Atomic Workers (OCAW).

One union is represented at ANL-W.

Major Site Activities/Initiatives:

Currently in the process of obtaining approval to use the Fuel Conditioning Facility (FCF) for electrometallurgical treatment of EBR II fuels.

The Fuel Manufacturing Facility (FMF) and the Zero Power Physics Reactor (ZPPR) vaults are planned for long term storage of plutonium and plutonium-bearing materials.

The Radioactive Scrap Waste Facility (RSWF) is being used for interim storage for solid, highly radioactive scrap (e.g., EBR-II fuel), radioactive waste, and radioactive mixed waste pending final disposition. The Radioactive Liquid Waste Treatment Facility (RLWTF) processes low-level radioactive liquid for disposal at the INEL Radioactive Waste Management Complex (RWMC).

Decontamination, decommissioning, and defueling of EBR II are under way.

ARG-W is in the process of completing an Environmental Assessment to allow operation of the FCF.

ARG-W is constructing a Sodium Processing Facility to process sodium reactor coolant from the FERMI I and EBR reactors.

ARG-W is performing waste characterization at the Hot Fuel Examination Facility (HFEF) to allow for shipment of waste to WIPP when it becomes available.

ENVIRONMENT, SAFETY, AND HEALTH (ES&H) ISSUES

A sitewide issue is an issue present at multiple facilities or within ES&H programs that impact sitewide operations.

Additional information on sitewide issues is provided in Section 3.0, starting on page 5.

Sitewide Issue 1: There are potential hazards associated with the shutdown and decommissioning of EBR-II in order to place the facility in a safe and stable condition.

Sitewide Issue 2: Six vulnerabilities identified by the Plutonium Working Group are related to the packaging of scrap and/or residue materials shipped to ANL-W from other DOE sites, and to the lack of up-to-date safety basis for two facilities.

KEY FACILITIES

A key facility is a facility or building that is significant from an environment, safety, and health perspective. At some sites, a key facility can be a group of facilities with similar missions, activities, hazards, or vulnerabilities.

Additional information on key facilities is provided in Section 4.0, starting on page 6.

There are ten key facilities at ANL-W.

Buildings 765 and 709, Fuel Conditioning Facility (FCF) - A pyrometallurgical processing facility where metallic fuels from the liquid-metal-cooled reactor EBR-II are conditioned for long term storage.

Building 752, Analytical Laboratory (AL), North Wings (A & B Wings) - Chemical, radiochemical, and physical measurements in support of the ANL-W nuclear and environmental programs.

Experimental Breeder Reactor-II - Uranium-plutonium-fueled, liquid-metal pool-type Category A breeder reactor with a thermal power rating of 62.5 megawatts (MW) with a secondary sodium loop and a steam plant that produces 19 mw of electrical power through a conventional turbine generator.

Building 785, Hot Fuel Examination Facility (HFEF) - Examination of highly irradiated fuels and materials in support of the Integral Fast Reactor and other Liquid Metal Reactor (LMR) programs.

Transient Reactor Test Facility (TREAT) - Zircaloy-clad graphite-moderated Category B reactor designed primarily for operation in the transient or pulse mode and for destructive testing of prototypic fast reactor highly enriched ceramic type fuel.

Neutron Radiography Reactor (NRAD) - Heterogeneous, water-moderated, solid-fueled, tank type reactor which operates at a steady state power of 250 kW.

Zero Power Physics Reactor (ZPPR) - Category B reactor, contained in a split-table-type critical facility and currently in a nonoperational standby status.

Fuel Manufacturing Facility (FMF) - Houses binary (i.e., uranium and zirconium) fuel manufacturing equipment and serves as a vault in which Category I quantities of special nuclear material, including Plutonium, are stored.

Building 798, Radioactive Liquid Waste Treatment Facility (RLWTF) - Processes low-level radioactive liquid waste from EBR-II, FCF, HFEF, TREAT, ZPPR, and support facilities.

Radioactive Scrap Waste Facility (RSWF) - Interim storage for solid, highly radioactive scrap (e.g., EBR-II fuel), radioactive waste, and radioactive mixed waste pending final disposition.

SITE PERFORMANCE

Site performance is based on an analysis of available data on facilities and programs. This includes information from Office of Oversight activities augmented by valid and relevant external and internal sources. Site performance is evaluated in terms of three of the guiding principles for safety management.

Additional information on site performance is provided in Section 2.0, starting on page 2.

Overall Safety Management Program - NOT EVALUATED

Principle #1 - Line Management Responsibility - NOT EVALUATED

CH oversight of ANL-W activities is in transition. CH Environment, Safety and Health Division (ESHD), now serves as a resource to the ARG-W ES&H organization, which is now responsible for conducting ES&H program reviews of ANL-W activities.

As a result of deficiencies in the ANL-W quality assurance program and in internal oversight of this program, programmatic changes were instituted; making Division Directors responsible for proper implementation of quality assurance requirements, establishing a more focused self-assessment group, and updating and issuing sitewide procedures.

In May 1995, CH renegotiated its contract with the University of Chicago. The contract contains a performance fee based on research and operations (which includes ES&H) performance.

Principle #2 - Comprehensive Requirements - NOT EVALUATED

Programs are generally documented and implemented. Noted examples include: industrial hygiene, industrial safety, fire protection, the EBR-II nuclear safety program, and construction management.

Principle #3 - Competence of Personnel - NOT EVALUATED

PERFORMANCE MEASURES

Performance measures are quantitative and qualitative indications of ES&H performance taken from such sources as the Occurrence Reporting and Processing System, and the Computerized Accident/Incident Reporting System, as well as contractually mandated indicators of performance.

To be provided in future versions of the site profile.

Additional Information on performance measures will be provided in Section 5.0 of future versions of the site profile.

Figure 1. ANL-W Site Map

SITE PROFILE -- ARGONNE NATIONAL LABORATORY - WEST (ANL-W)

1.0 SITE CHARACTERISTICS

1.1 SITE LOCATION AND SIZE

The Argonne National Laboratory-West (ANL-W) is located in Idaho at the Idaho National Engineering Laboratory (INEL). ANL-W is a part of the main Argonne National Laboratory, which is located near Chicago, Illinois. ANL-W occupies about 810 acres, of which only 84 acres are inside the property protection area, the INEL occupies 890 square miles. It is approximately 31 miles from the nearest ANL-W site boundary to Idaho Falls, Idaho. Other smaller communities such as Arco, Blackfoot, Dubois, and Howe are also adjacent to the INEL site. The nearest incorporated town, Atomic City (population 8), is one half mile from the southern boundary of the INEL site and approximately 18 miles southwest of the ANL-W site. Most of the INEL site is unpopulated, semiarid desert rangeland and sagebrush over volcanic deposits.

1.2 SITE MISSION

ANL-W initially constituted the testing and development arm of Argonne for advanced reactors, with facilities designed to proof-test liquid metal reactor technology and associated fuel cycles. The research included reactor safety, fuels and materials, fuel manufacturing, metal fuel processing, fuel cycle, related waste management, and actinide recycling.

The ANL-W mission has recently changed due to the cancellation of the Integral Fast Reactor (IFR) Program and shutdown of the Experimental Breeder Reactor II (EBR-II). The new mission is focused on developing environmental remediation technologies ANL-W has five reactors, fuel examining facilities, analytical laboratories, radioactive waste treatment facilities, and many support buildings. Some of the activities include decontamination and defueling of EBR II, and developing techniques for processing EBR II fuel for long-term storage, treating sodium waste for disposal, and characterizing solid waste for shipment to Waste Isolation Pilot Plant (WIPP).

1.3 SITE ORGANIZATIONS AN D CONTRACT STATUS

Site Organizations

Contractor activities at ANL-W are managed by DOE's Argonne Group-West (ARG-W) under the direction of DOE's Chicago Operations Office (CH). ANL-W is operated by the University of Chicago, and it is a part of the main Argonne National Laboratory.

Contract Status

In May 1995, the laboratory operating contract with the University of Chicago was renegotiated. The new contract includes a performance fee based on performance of research and operations, including ES&H performance. Performance objectives and supporting metrics are being developed to administer the contract and performance fee. The new contract is considered a model for non-profit organizations.

1.4 MAJOR SITE INITIATIVES/ACTIVITIES

Spent Fuel Storage and Management

ANL-W is in the process of obtaining approval to use the Fuel Conditioning Facility (FCF) for electrometallurgical treatment of EBR II fuels. The treatment process removes the uranium from the spent fuel; the transuranic elements and fission products remain in the salt mixture; and the sodium chemically combines with the salt mixture to form sodium chloride. The recovered uranium will then be blended to a low enriched uranium product and placed in storage. The transuranic elements and fission products are removed from the salt mixtue

and processed through a zeolite ion exchanger and then fabricated into a ceramic waste form for storage. The salt mixture will be disposed of as low level radioactive waste.

The Fuel Manufacturing Facility (FMF) and the Zero Power Physics Reactor (ZPPR) vaults are planned for long term storage of uranium, plutonium and plutonium-bearing materials at ANL-W.

Waste Management

The Radioactive Scrap Waste Facility (RSWF) is being used for interim storage for solid, highly radioactive scrap (e.g., EBR-II fuel), radioactive waste, and radioactive mixed waste pending final disposition. The Radioactive Liquid Waste Treatment Facility (RLWTF) processes low-level radioactive liquid for disposal at the INEL Radioactive Waste Management Complex (RWMC). Radioactive mixed waste is managed at the Fermi Sodium Storage building (Building 703) and at the Radioactive Sodium Storage Facility (building 797).

Decontamination and Decommissioning
Defueling of EBR II is currently under way.

Programmatic Activities

The FCF was formerly called the Fuel Cycle Facility, but was renamed the Fuel Conditioning Facility (FCF) subsequent to the March 1994 decision to shut down and decommission EBR-II. ARG-W is in the process of completing an Environmental Assessment to allow operation of the FCF.

ANL-W is currently constructing a Sodium Processing Facility to process sodium reactor coolant from the FERMI I and EBR reactors. The facility will process the sodium coolant to a sodium carbonate to allow for land disposal.

ANL-W is currently performing waste characterization at the Hot Fuel Examination Facility (HFEF) to allow for shipment of waste to WIPP when it becomes available.

WIPP Gas Generation Experiments are being conducted in the Blanket Storage Room inside the ZPPR Reactor Cell.

The Plasma Health Process Bench Scale Demonstration is to be conducted in the TREAT Reactor Building High Bay Area. Construction for this demonstration project is nearing completion.

Environmental restoration activities are proceeding in Waste Area Group (WAG) 9.

The treatment of EBR-I sodium-potassium (NaK) coolant is being conducted at the Sodium Components Maintenance Shop.

2.0 SITE PERFORMANCE

2.1 CONCEPTUAL BASIS FOR EVALUATION

The essential characteristics of successful programs and projects are recognizing and understanding of the need for an effective management system that ensures adequate control over all aspects of the program or project. In 1994, the Secretary of Energy forwarded to Congress and the Defense Nuclear Facilities Safety Board the principles and criteria that the Department deemed necessary for an effectivesafety management program. These principles include:

- Principle #1: Line managers are responsible and accountable for safety.
- Principle #2: Comprehensive requirements exist, are executed, and are appropriate.
- Principle #3: Competence is commensurate with responsibilities.

2.2 SAFETY MANAGEMENT PROGRAM IMPLEMENTATION OF THE GUIDING PRINCIPLES

This interim evaluation was developed using information provided to theOffice of Oversight by ARG. This information consists of a *Summary Appraisal Report of Argonne*

National Laboratory for Fiscal Year 1995 and data on injuries, illnesses, and radiological exposures.

The absence of an EH independent oversight evaluation at ANL-W suggests that the information presented should not necessarily be considered representative of overall ES&H performance across ANL-W, but rather limited to an indication of the ES&H performance of the program and/or facility identified. Where sufficient information was not available to make a comprehensive assessment of either the implementation of a guiding principle (Section 2.2) or an implementing program (Section 2.3), a limited evaluation or specific example of performance based on the best available information is provided.

Principle #1 - Line Management Responsibility for Safety

CH oversight of ANL-W activities is in transition. CH Environment, Safety and Health Division (ESHD), was responsible for conducting the periodic appraisals of ANL-W. That responsibility has now been assigned to ARG-W, with technical support being provided by the former CH Environment, Safety and Health (ES&H) safety professionals.

Improvement is needed in the implementation of the quality assurance program. Recent DOE reviews have identified failures to adhere with approved project quality assurance plans which were not recognized by the ANL-W internal assessment program, (see Facility Safety Program in Section 2.3). As a result a number of programmatic changes were instituted including: (1) making Division Directors responsible for proper implementation of quality assurance requirements, (2) establishing a more focused self-assessment group to provide independent and continuing appraisals of quality assurance implementation, and (3) updating and issuing applicable sitewide procedures.

In May 1995, ARG renegotiated its contract with the University of Chicago. The contract contains a performance fee based on research and operations (which includes ES&H) performance. DOE considers the new contract to be a model for nonprofit organizations. Performance objectives and supporting performance measures are developed to support administration of the contract. Performance measurement information using this new contract structure will not be generated until the end of fiscal year 1996.

Principle #2 - Comprehensive Requirements

Programs are generally documented and implemented. Notable examples include industrial hygiene, industrial safety, fire protection, radiation safety, the EBR-II nuclear safety program, and construction management.

Further program development and implementation are necessary in the quality assurance program.

Principle #3 - Competence Commensurate with Responsibilities

Not evaluated.

2.3 IMPLEMENTING PROGRAMS

Environmental Protection Program

ANL made progress on the accelerated comprehensive Remedial Investigation (RI) for ANL-W inactive waste sites. The RI process has been accelerated by one year from the Federal Facility Agreement enforceable milestone. However, the funds management aspects need improvement. ANL-W has experienced some difficulty in submitting Remedial Investigation documents to DOE with enough lead time to allow adequate DOE review before submittal to regulators.

ANL upgraded the RSWF and as a result the facility is a safer, more effective operation. Management of mixed wastes improved with the dedication of additional staff resources to waste packaging, transport, and

documentation. The amount of mixed waste stored onsite decreased, and carryover funds were reduced.

ANL-W combined its environmental restoration, waste management, and environmental monitoring functions under one manager. Progress has been demonstrated in permitting activities, waste container management and shipment, and waste facility upgrades. A review of small quantity hazardous and mixed waste accumulation areas by ARG-W resulted in eight findings concerning small waste container management.

To address the problems of small quantity waste accumulation area management, ANL-W has assigned Environmental Compliance Representatives (ECRs) to all ANL-W facilities. The ECRs are independent in that they report to the Environment and Waste Manager, and not to facility managers. Implementation of the ANL-W Waste Handling Manual will provide formality and standardization and address deficiencies associated with moving radioactive and mixed waste to offsite storage and disposal locations in a timely manner.

Efforts have been commendable in preparing the Federal Facility Compliance Agreement, Site Treatment Plan for mixed wastes and the Resource Conservation and Recovery Act Permit Applications for facilities to store mixed waste.

Nuclear Safety Program

In support of the primary ANL-W mission of defueling EBR-II and placing it in an industrially and radiologically safe shutdown condition, the goal of removal of 170 subassemblies was met and exceeded. Transition of the EBR-II organization to better support defueling operations has been accomplished with minimal impact. Reportable occurrences have decreased from 16 in fiscal year 1994 to 3 in fiscal year 1995.

Worker Safety and Health Program

The startup reviews for FCF indicated no findings or weaknesses in the overall industrial hygiene program. Improvement can be achieved through facility management recognizing introduction of new hazards into the workplace and ensuring the involvement of site industrial hygiene professionals.

The industrial safety program demonstrated progress through increased involvement of industrial safety professionals as part of the work control process and the initiation of facility walkthroughs by line management. There was significant improvement in the number of reportable accidents and the number of lost workdays at ANL-W in 1995.

Maintenance of fire protection equipment is excellent. Response of ANL-W personnel to the brush fire of August 16, 1995, was exceptional. Progress is continuing on sitewide fire alarm upgrades, and fire alarms are now monitored at the ANL-W Security Central Alarm Centers.

Facility Safety Program

In 1995, two facility upgrade programs were ongoing—the FCF Modifications Program and the Analytical Laboratory Upgrades Program. A DOE Line Management Readiness Evaluation of FCF indicated that in spite of a satisfactory Project Quality Assurance Plan, there were instances in which the plan had not been followed, especially in the areas of installation and testing. A DOE review of the Analytical Laboratory Upgrades Program indicated that the project team deferred implementation of the Project Quality Assurance Plan in favor of the construction contractor's plan. However, there was not full compliance with this latter plan. In neither instance did the ANL-W project teams or the internal independent quality assurance assessment function identify these discrepancies and take corrective action.

Construction management practices improved through performance of the EBR-II Plant Closure Project, achievement of operation readiness of FCF, and completion of the

Analytical Upgrades Project. Use of a "project approach" has resulted in major improvements in meeting cost and schedule targets.

ANL-W continues to make good progress toward incorporation of all DOE order requirements for emergency management. ANL-W's participation in the Advanced Test Reactor emergency exercise was noted as being excellent. ANL-W supported evacuation and response to the large range fire on August 16, 1995.

3.0 SITEWIDE ES&H ISSUES

3.1 ISSUE DESCRIPTIONS

Sitewide Issue 1: Impacts of Defueling EBR-II and Workforce Downsizing

Cancellation of the IFR has resulted in the shutdown of EBR-II and the eventual downsizing of the workforce at ANL-W. The current workforce is stabilized while EBR-II undergoes defueling. However, potential hazards are associated with the shutdown and decommissioning of EBR-II in order to place the facility in a safe and stable condition (e.g., loss of argon cooling, fuel handling accidents, sodium-water reactions, and malfunctioning equipment).

On March 15, 1994, the Secretary of Energy convened a working group to study how best to use the capabilities of ANL to advance technology in nuclear safety, waste management, nonproliferation, and other areas of national priority. The Administration found that the Actinide Recycle Program does not support its nonproliferation policy, and as a result terminated the IFR Program.

Sitewide Issue 2: Plutonium Vulnerabilities

The purpose of the plutonium vulnerability assessment was to ensure that responsible managers were cognizant of the ES&H and nonproliferation concerns associated with management and cleanup of the wide variety of forms of plutonium throughout the DOE complex. The Plutonium Working Group identified six plutonium vulnerabilities during their assessment at ANL-W.

1. Plutonium metal at ZPPR is improperly packaged. Hydrogen buildup, oxidation, and expansion can rupture the can and potentially contaminate workers.

2. Plutonium oxide at ZPPR is improperly packaged. Pressurization can cause rupture of the can and potential for worker contamination.

3. The MK III sodium test loops in the Transient Reactor Test Facility (TREAT) represent a potential hazard to workers and the environment because their seals have not been inspected in approximately five years.

4. Questionable packaging of plutonium metals and oxides at the (FMF) could lead to expansion or pressurization of the can until it breached, contaminating the facility and/or personnel.

5. The ANL-W planned disposition of 1 to 3 kg of plutonium oxide fines may not represent the safest approach. These oxides may be generated during inspection and repackaging of cans of metal and alloys stored at the ZPPR and FMF. The site has chosen a disposal option that may be the least onerous, but may not be the most technically sound.

6. Both the FMF and ZPPR vaults are planned for long-term storage of plutonium and plutonium-bearing materials at ANL-W. However, DOE Headquarters rejected the implementation plan for upgrading the FMF and ZPPR vaults' safety documentation. Under the new requirement of DOE Order 5480.23, both vaults would be classified as Hazard Category II, but the documentation currently reflects Hazard Category III; in the case of ZPPR, the only documentation is a 1980 Safety

Assessment Document, which contains no independent analysis for the vaults. The safety analysis for the FMF vault was approved by DOE in August 1986.

ANL-W has prepared and submitted to the Office of Nuclear Energy (NE-2) a Corrective Action Plan to address the vulnerabilities identified by the Plutonium Working Group. Corrective actions identified in the plan are under way.

3.2 SITEWIDE ISSUE STATUS

Table 1 characterizes sitewide issues in terms of an issue statement, primary concerns, site activities, and a progress evaluation.

4.0 KEY FACILITIES

4.1 FACILITY MISSION

Buildings 765 and 709, Fuel Conditioning Facility (FCF)

The FCF is a pyrometallurgical processing facility where metallic fuels from the liquid metal-cooled reactor EBR-II are conditioned for long term storage. The process includes: (1) fuel element segmentation through a chopping process, (2) fuel electro-refinement to remove rare earths, (3) consolidation of fuel in a cathode processor, and (4) processing with a salt stripper to remove rare earths from salt. These processes take place in a shielded, inert atmosphere hot cell, and include high-temperature molten metal, high-electrical-energy sources, and highly radioactive material.

The FCF began operating in 1965 and was briefly renamed the Hot Fuel Examination

Table 1. Sitewide Issues

ISSUE	PRIMARY CONCERNS	SITE ACTIVITIES	PROGRESS EVALUATION
1. There are potential hazards associated with the shutdown and defueling of EBR-II in order to place the facility in a safe and stable condition.	These hazards include: • Fuel handling accidents from internal or external initiating events resulting in unplanned criticality • Hydrogen explosion from sodium-water reactions • Operational problems arising from malfunctioning equipment that contribute to increased occupational radiation exposure to the workers.	CH and contractor management are aware of the potential problems associated with the ongoing activities at ANL-W. They are remaining alert for any signs that there may be a deteriorating trend in the area of health and safety and are applying increased management attention to this area.	The defueling of EBR-II is currently on time without any significant occurrences. The workforce, in general, has accepted the future downsizing. Approximately 17 people have been laid off to date. **(updated 5/96)**
2. Six vulnerabilities identified by the Plutonium Working Group are related to the packaging of scrap and/or residue materials shipped to ANL-W from other DOE sites, and to the lack of up-to-date safety basis for two facilities.	The inadequate packaging of plutonium poses a risk of facility and personnel contamination. In addition, the ZPPR and FMF vaults do not have an up-to-date safety basis, both of whose hazard category and dose evaluation criteria have changed.	ANL-W has prepared and submitted to the Office of Nuclear Energy (NE-2) a Corrective Action Plan to address the vulnerabilities identified by the Plutonium Working Group. Corrective actions identified in the plan are under way.	Corrective actions have been successful. Assuming future funding is provided, the identified vulnerabilities will be corrected. **(updated 5/96)**

Facility-South (HFEF-S) in 1969 after removal of fuel processing equipment and conversion to fuel examination. The facility was extensively decontaminated from 1977 through 1980 and remained an examination facility until 1990, when it was renamed the Fuel Cycle Facility and received extensive modifications in support of the IFR Program.

This facility was then renamed the Fuel Conditioning Facility after the March 1994 decision to shut down and decommission EBR-II. A contractor Operational Readiness Review (ORR) was performed in March 1995, and a DOE ORR was performed in May 1995. The contractor ORR identified weaknesses in system labeling, recalibrating instrumentation, and conduct of operations. The DOE ORR findings included a need to validate procedures for Technical Safety Requirement compliance, develop a program for continuing qualification of on-the-job training, confirm compliance with National Environmental Policy Act (NEPA) requirements, and correct deficiencies in the waste management program. Although the Prestart Findings from the ORRs have been completed, operation of the FCF has delayed pending approval of an Environmental Assessment.

Building 752, Analytical Laboratory (AL), North Wings (A & B Wings)

The primary mission of the AL is to provide chemical, radiochemical, and physical measurements in support of the ANL-W nuclear and environmental programs. The lab processes highly radioactive material and includes six shielded hot cells, decontamination and manipulator repair room, glove boxes, and storage vaults. Analytical processes include inductively coupled plasma-atomic emission spectrometers, atomic absorption spectrometers, ion chromatographs, gamma and alpha spectrometers, time of flight mass spectrometers, x-ray diffractometer (x-ray generator), mass spectrometer, laser, and other analytical equipment. The facility includes the Non-Destructive Assay (NDA) Laboratory and the Casting Laboratory (CL). The AL was placed in operation in the early 1960s. Extensive facility modifications were made to upgrade the facility in 1993 and 1994 and included improvement in the ventilation system with the addition of double high efficiency particulate air (HEPA) filtration of hot cells and removal of perchlorate contaminated air hoods. Electrical services were upgraded to meet current code. DOE and contractor ORRs were completed in July and August 1995, respectively.

Experimental Breeder Reactor-II

The EBR-II was a uranium-plutonium-fueled, liquid-metal pool-type Category A reactor with a thermal power rating of 62.5 megawatts (MW) with a secondary sodium loop and a steam plant that produced 19 MW of electrical power through a conventional turbine generator. The facility consists of the following buildings: 767, EBR-II Reactor Containment Building; 768, Power Plant; 768B, Water Chemistry Building; 766, Sodium Boiler Plant; 793, Sodium Component Maintenance Shop; 788, EBR-II Maintenance Shop; and 789, EBR-II Engineering Building. EBR-II is currently shut down and being defueled. Defueling includes the removal of 475 fuel and blanket subassemblies and the processing of 90,000 gallons of primary sodium coolant. The process of fuel removal is expected to continue through 1996, followed by processing of the sodium coolant in the Sodium Processing Facility.

EBR-II was placed in operation in 1964. No design inadequacies were identified that will affect its current shutdown status or decommissioning.

Building 785, Hot Fuel Examination Facility (HFEF)

The HFEF is a hot cell complex designed and equipped to examine highly irradiated fuels and materials and was to support the Integral Fast Reactor and other Liquid Metal Reactor (LMR) programs. The facility provides storage

for approximately 1,500 individual fuel elements. The facility also has a high bay area that provides waste characterization of contact-handled, transuranic waste in preparation for shipment to the DOE WIPP site. The facility houses the Neutron Radiography (NRAD) reactor, which is a 250 kW Training Research Isotope Production General Atomic (TRIGA) nuclear reactor. NRAD is located in a basement subcell. The HFEF Hot Cell area includes an air atmosphere decontamination cell, an argon atmosphere main cell, decontamination areas, and repair areas for hot cell equipment.

The HFEF was placed in operation in 1975. Major modifications were made in 1975 for handling a large irradiated sodium containing test loop (SLSF) and in 1992 for the addition of the Waste Characterization Area (WCA). The facility will be providing mixed waste characterization, repackaging, and container treatment preparation for disposal at WIPP and other DOE facilities in support of the INEL Site Treatment Plan. The facility is well maintained and in excellent physical condition.

Transient Reactor Test Facility (TREAT)

The TREAT is a Zircaloy-clad, graphite moderated Category B reactor designed primarily for operation in the transient or pulse mode and for destructive testing of prototypic fast reactor highly enriched ceramic type fuel. TREAT can also be used as a large neutron-radiography source. The facility consists of the following buildings: 720, TREAT Reactor Building; 721, TREAT Office Building; 723, TREAT Warehouse; and 724, TREAT Reactor Control Room.

TREAT was placed in operation in 1959. Major modifications and additions were made in 1963, 1972, 1979, and 1982. The only known design deficiency is that Dynamic Seismic Loading criteria were not used in the design of the TREAT reactor or building; however, the design is considered adequate. TREAT was placed in radiologically safe shutdown in 1995.

Neutron Radiography Reactor (NRAD)

The NRAD is a heterogeneous, water-moderated, solid-fueled, tank type reactor that operates at a steady state power of 250 kW. The reactor is located in the basement of HFEF (Building 785) and uses TRIGA/FLIP fuel and a standard TRIGA instrument and control system. The NRAD control room is located on the main floor. The Reactor Room is maintained at a negative pressure with respect to HFEF to control the spread of radioactive particulate.

The NRAD facility provides the basic capability for obtaining neutron radiographs of both irradiated and unirradiated fuels and materials under examination at the HFEF and provides irradiation capabilities for other laboratory supported programs.

The NRAD was placed in operation in 1977. The facility was modified in 1982 with the addition of a North Radiography Station (NRS), which provides the capability to neutron radiograph irradiated or unirradiated specimens from other facilities without exposing them to the alpha contaminated HFEF main cell.

Zero Power Physics Reactor (ZPPR)

The ZPPR, a Category B reactor, is a split-table-type critical facility and is currently in a nonoperational standby status. The ZPPR was designed for simulating the properties of a liquid metal reactor (LMR), from small space reactors to 1,000 MWE cores, while operating at low power levels (10 to 50 watts) and never exceeding 2,000 watts. The integrated power over life was only 950,000 watt-hours which is less than EBR-II produced in 1 minute. Accordingly, radioactivity levels are minimal, allowing contact handling of fuel and structural components. The fuel is essentially unirradiated and contains almost no fission products. The reactor is air cooled, and the core is readily accessible for hand loading of reactor material.

The facility consists of the following buildings: 775, Vault-Workroom Equipment Room used for fuel-loading and fuel-storage; 776, Reactor Cell where the reactor is in a defueled standby status; 784, Materials Control Building used for storage of non-fissile material plates for reactor mockups; 792, Mockup Building; 774, ZPPR Support Wing, which contains the ZPPR Control Room, a small research reactor—Argonne Fast Source Reactor (AFSR) in a permanent shut down status awaiting D&D, and office space.
The ZPPR was placed in operation in 1969. No design inadequacies that will affect its current shutdown status were identified.

Fuel Manufacturing Facility (FMF)

The FMF serves a dual purpose of housing binary (i.e., uranium and zirconium) fuel manufacturing equipment and a vault in which Category I quantities of special nuclear material, including plutonium, are stored. The vault air is continuously monitored for airborne radioactive contamination, including plutonium. The exhaust is HEPA filtered and monitored for alpha and gamma activity.

The FMF was utilized to manufacture and store fuel slugs, elements and subassemblies. Currently FMF is used to manufacture stainless steel dummy subassemblies for placement in the EBR-II reactor as part of the defueling effort. The fuel manufacturing activities in the FMF did not include Pu except for leak testing, bonding, and subassembly manufacturing involving sealed elements.

Building 798, Radioactive Liquid Waste Treatment Facility (RLWTF)

The RLWTF is a small two-story, 5000 ft^2 facility that processes low-level radioactive liquid waste from EBR-II, FCF, HFEF, TREAT, ZPPR, and support facilities. The process is designed to evaporate 60,000 gallons of low-level aqueous radioactive waste annually using a Shielded Hot Air Drum Evaporator (SHADE). SHADE utilizes heated air (250 F) in an adiabatic saturation process wherein moisture is absorbed by the hot air moving through a cascading spray and over standing water in a drum processor. Facility operations are dependent on the radioactive liquid waste inventory. The facility is normally unmanned with the exception of shift routines to record operating parameters when the facility is operating.

Radioactive Scrap Waste Facility (RSWF)

The RSWF, Building 771, provides interim storage for solid, highly radioactive scrap (e.g., EBR-II fuel), radioactive waste, and radioactive mixed waste pending final disposition. The facility consists of a rectangular array of about 1,200 vertical, carbon-steel-lined storage positions. Each storage position is a cylindrical hole bored into the ground, measuring about 2 feet in diameter and 12 feet in depth. The storage positions are distributed along a row on 6- foot centers and spaced 12 feet apart. A wide variety of radioactive scrap and waste, packaged in a variety of configurations, is stored in about 740 of the storage positions. RSWF is being upgraded with new cathodically protected liners. Material that was not originally stored in liners is being relocated and placed into new cathodically protected liners.

The RSWF was placed in operation in 1965. The facility upgrade project was initiated in 1989 to replace the carbon steel liners following discovery of three significantly corroded liners in 1988; the liners should have had a typical design life of 20 to 50 years. It is anticipated that an additional 1,350 liners will be installed to increase the capacity of the facility to support EBR-II shutdown.

RSWF is not normally occupied except for construction, maintenance, or material transfer operations. During these activities, up to approximately ten personnel would be located in the RSWF vicinity.

4.2 FACILITY SUMMARY

Table 2 summarizes key facility characteristics, including status, hazard classification, authorization basis, worst case design basis accident, and principal hazards and vulnerabilities.

5.0 PERFORMANCE MEASURES

This section is under development and will be presented in future versions of the site profile.

Table 2. Facility Summary

FACILITY NAME	STATUS	HAZARD CLASSIFICATION/ AUTHORIZATION BASIS	WORST CASE DESIGN BASIS ACCIDENT	PRINCIPAL HAZARDS AND VULNERABILITIES
Fuel Conditioning Facility: Buildings 765 & 709	Operational for fuel storage.	Category (Cat) II nuclear facility; Safety Basis - FCF FSAR 6/9/93 (DCN F0000-0018-AK)	Severe flow reversal in the air cell exhaust system - 50 yr committed effective dose equivalent (CEDE) at site boundary is $1.3x10^{-2}$ mSv.	Fissile and radioactive solids and gases, exposed heavy metals, hazardous metals, hydrogen, argon, sodium
Analytical Laboratory Building 752, North Wings (A & B Wings)	Operational.	Cat III nuclear facility; Safety Basis - ANL-W Analytical Laboratory Safety Analysis Report, April 1995, WO660-0055-KW.	Fire in Hot Cell result in < 0.5 mrem CEDE at site boundary.	Fissile material (U), transuranic waste (Pu, Np, Am, U), cadmium, fission and activation products
Experimental Breeder Reactor II: Bldgs. 766-768, 793, 788 & 789	Shut down.	Cat I nuclear facility; Safety Basis - EBR-II Hazards Summary Report (HSR), (ANL-5719), issued May 1957 with 28 addenda, the latest revision in 1990	Core meltdown due to high reactivity addition has no offsite consequence due to double containment.	Fissile and radioactive solids, sodium, radioactive fission gases, hydrogen, and argon
Hot Fuel Examination Facility: Building 785	Operational.	Cat II nuclear facility; Safety Basis - Hot Fuel Examination Facility/North Facility Safety Report, ANL-7959. Requires upgrade with respect to nuclear and hazardous chemical inventories.	Loss of containment barrier combined with loss of coolant to fuel results in 30 rem to critical organ at site boundary.	Spent fuel and reactor irradiated nuclear material containing plutonium, fission products, sodium, argon, hydrogen
Transient Reactor Test Facility: Buildings 720, 721, 723, and 724	Shut down.	Cat II nuclear facility; Safety Basis - FSAR 8/92 (DCN S3942-0001-YT-03)	Reactor reactivity insertion, will not cause core damage or offsite consequence.	Enriched uranium, Zircaloy, Inconel, fission products, sodium, graphite, reflector blocks, lead shield blocks, asbestos
Neutron Radiography Reactor: Building 785	Operational.	Cat II nuclear facility; Safety Basis - HFEF/N Neutron Radiography Facility Reactor Final Safety Analysis Report, 8/77 (DCN W0170-0015-SA-00) Addendum 9/82 (w-31-109-eng-38)	Failure of cladding in a four element cluster during a loss of coolant, resulting in whole body dose at site boundary of 0.003 mrem.	Reactor fuel (enriched uranium and erbium)
Zero Power Physics Reactor	Non-operational Standby.	Cat II nuclear facility; Safety Basis - Final Safety Analysis Report on the Zero Power Plutonium Reactor (ZPPR) Facility, ANL-7471, 6/72, ZPPR Vault Safety Assessment Document (SAD), 1980	Workroom fire ; presents no unacceptable risks to personnel or surrounding facilities.	Fissile material (plutonium and uranium), low-level fission products, and small quantities of actinides in the fuel
Fuel Manufacturing Facility	Operational.	Cat II nuclear facility; Safety Basis - Final Safety Analysis Report for the Fuel Manufacturing Facility (ANL-IFR-57), 12/86	Uranium fire inside casting furnace results in insignificant dose at site boundary.	Nuclear fuel elements, uranium, and plutonium
Radioactive Liquid Waste Treatment Facility: Building 798	Operational.	Radiological facility per DOE-STD-1027-92; Safety Basis - Safety Analysis Report for the Radioactive Liquid Waste Treatment Facility (W7980-0115-ES)	Spill of contents of tanker results in no significant dose at the site boundary.	Low-level mixed fission product with tritium, Cs-137, and Sr-90, and trace amounts of Co-60, uranium, and other fission products
Radioactive Scrap Waste Facility: Building 771	Operational.	Cat II nuclear facility; Safety Basis - Final Safety Analysis Report for the Radioactive Scrap and Waste Facility, 1983, ANL Safety Assessment for Storage of EBR-II fuel (1992), Criticality Hazard Control Statement, FE-CHCS-A18	13 foot drop accident of a waste can; no significant consequence at site boundary.	Fissile material, heavy metal, mixed waste, and fission products